

CLAIMS

What is claimed is:

1. A method of preparing a moldable polymer composition comprising:
 - (a) forming a mixture of thermoplastic material and a curable fluorocarbon elastomer at a temperature above the melting point of the thermoplastic;
 - (b) adding a curing composition to the mixture, wherein the curing composition comprises an initiator having a half-life of 0.1 hours or more at a temperature of about 180°C or higher and crosslinking agent; and
 - (c) heating while continuing to mix the mixture and the curing composition.
2. A method according to Claim 1, wherein the initiator has a half-life of 0.1 hours or more at a temperature of about 190°C or higher.
3. A method according to Claim 2, wherein the initiator has a half-life of 0.1 hours or more at a temperature of about 200°C or higher.
4. A method according to Claim 1, wherein the thermoplastic material comprises a fluorine-containing thermoplastic polymer.
5. A method according to Claim 1, wherein the curable fluorocarbon elastomer comprises a copolymer of VDF, HFP, and a cure site monomer.

6. A method according to Claim 5, wherein the curable fluorocarbon elastomer comprises a copolymer of VDF, HFP, TFE, and a cure site monomer.

7. A method according to Claim 1, wherein the fluorocarbon elastomer comprises a copolymer of VDF, fluorinated vinyl ether, TFE, and a cure site monomer.

8. A method according to Claim 1, wherein the fluorocarbon elastomer comprises a copolymer of VDF, propylene, TFE, and a cure site monomer.

9. A method according to Claim 1, wherein the fluorocarbon elastomer comprises a copolymer of VDF, TFE, HFP, ethylene, fluorinated vinyl ether, and a cure site monomer.

10. A method according to Claim 1, wherein the fluorocarbon elastomer comprises a perfluoro rubber.

11. A method according to Claim 1, wherein the fluorocarbon elastomer comprises a copolymer of TFE and propylene.

12. A method according to Claim 1, comprising heating the mixture above about 180°C.

13. A method according to Claim 12, comprising heating the mixture above about 190°C.

14. A method according to Claim 13, comprising heating the mixture above about 200°C.

15. A process for making a melt processable fluorocarbon rubber composition comprising:

- (a) adding a peroxide masterbatch to a molten blend of a first portion of fluorocarbon elastomer and a thermoplastic material, wherein the masterbatch comprises greater than or equal to about 5% weight percent organic peroxide and further comprises a second portion of a fluorocarbon elastomer; and
- (b) mixing the peroxide masterbatch, the first portion of fluorocarbon elastomer, and the thermoplastic material while heating for a time and at a temperature sufficient to effect cure of the fluorocarbon elastomers.

16. A process according to Claim 15, using a twin-screw extruder having a first feeder and a second feeder downstream from the first feeder, wherein said adding comprises:

- (i) injecting a composition comprising the first portion of fluorocarbon elastomer and the thermoplastic material into the first feeder of the extruder; and
- (ii) adding the masterbatch into the with a second feeder of the extruder.

17. A process according to Claim 15, wherein the fluorocarbon elastomer of the first portion and the second portion are the same.

18. A process according to Claim 15, wherein the fluorocarbon elastomer comprises a copolymer of vinylidene fluoride and cure site monomers containing iodine.

19. A process according to Claim 15, wherein the peroxide masterbatch comprises greater than about 10% by weight percent peroxide.

20. A process according to Claim 15, wherein the peroxide masterbatch comprises greater than about 20% by weight percent peroxide.

21. A process according to Claim 19, wherein the thermoplastic material comprises a fluoroplastic.

22. A process according to Claim 21, wherein the fluoroplastic comprises a vinylidene fluoride homopolymer.

23. A process according to Claim 21, wherein the fluoroplastic comprises a vinylidene fluoride copolymer.

24. A molded article comprising a peroxide cured dynamic vulcanizate of a fluorocarbon elastomer and a fluorine containing thermoplastic, having a tensile modulus above about 10 MPa.

25. A molded article according to Claim 24, having a tensile modulus above about 12 MPa.

26. A molded article according to Claim 25, having a tensile modulus above about 15 MPa.

27. A molded article according to Claim 24, comprising a discrete phase of cured fluorocarbon elastomer and a continuous phase of a fluoroplastic material.

28. A molded article according to Claim 26, wherein the fluorocarbon elastomer comprises a copolymer of VDF and HFP.

29. A molded article according to Claim 28, wherein the fluorocarbon elastomer comprises a copolymer of VDF, HFP, and TFE.

30. A molded article according to Claim 26, wherein the fluorocarbon elastomer comprises a copolymer of VDF, fluorinated vinyl ether, and TFE.

31. A molded article according to Claim 26, wherein the fluorocarbon elastomer comprises a copolymer of VDF, TFE, and propylene.

32. A molded article according to Claim 26, wherein the fluorocarbon elastomer comprises a copolymer of VDF, HFP, TFE, fluorinated vinyl ether, and ethylene.

33. A molded article according to Claim 26, wherein the fluorocarbon elastomer comprises a perfluoro rubber.

34. A process for making melt processable fluoroelastomer composition comprising:

- (a) blending a thermoplastic polymeric material and a first fluorocarbon elastomer to form a first mixture at a temperature above a melt flow temperature of the thermoplastic;
- (b) combining the first mixture with a second mixture comprising a second fluorocarbon elastomer and greater than or equal to about 5% by weight of an organic peroxide at a temperature below that at which the peroxide would activate to initiate crosslinking of the second fluorocarbon elastomer; and
- (c) blending the first and second mixtures together while heating at a temperature and for a time sufficient to cure the fluorocarbon elastomer in the first and second mixtures.

35. A method according to Claim 34, wherein the second mixture further comprises a crosslinker containing at least two sites of olefinic unsaturation.

36. A method according to Claim 35, wherein the crosslinker comprises triallylisocyanurate.

37. A method according to Claim 35, wherein the first mixture further comprises a crosslinker containing at least two sites of olefinic unsaturation.

38. A method according to Claim 37, wherein the crosslinker comprises triallylisocyanurate.

39. A continuous process for preparing a peroxide cured dynamic vulcanizate of a fluorocarbon elastomer in a thermoplastic, using a twin-screw extrusion apparatus having a barrel, a first feeder, and a second feeder that is downstream of the first feeder, comprising:

- (a) delivering a solid blend of an uncured fluorocarbon elastomer and thermoplastic to the first feeder;
- (b) injecting the solid blend into the barrel of the extruder, wherein the barrel is heated above a melt flow temperature of the thermoplastic;
- (c) mixing the solid blend in the extruder to form a homogeneous melt blend;
- (d) injecting a peroxide masterbatch to the second feeder, wherein the peroxide masterbatch comprises an uncured fluorocarbon elastomer and greater or equal to about 5% by weight of an organic peroxide;
- (e) mixing the peroxide masterbatch and the homogenous melt blend in the barrel while continuing to heat at a temperature and for a time sufficient to effect cure of the fluorocarbon elastomers, and;
- (f) extruding the mixture from the twin-screw extruder.

40. A process according to Claim 39, wherein the peroxide masterbatch is delivered to the second feeder with a twin screw apparatus that blends the organic peroxide and fluorocarbon elastomer at a temperature less than that which would activate the peroxide.

41. A process according to Claim 39, wherein the fluorocarbon elastomers comprise a copolymer of vinylidene fluoride and a cure site monomer, and the thermoplastic comprises a fluoroplastic.

42. A process according to Claim 41, wherein the fluoroplastic comprises a vinylidene fluoride polymer.

43. A process according to Claim 39, comprising heating the barrel above about 180°C.

44. A process according to Claim 43, comprising heating the barrel above about 210°C.

45. A process according to Claim 44, comprising heating the barrel above about 240°C.

46. A process according to Claim 39, wherein the peroxide masterbatch further comprises a crosslinker containing two or more sites of olefinic unsaturation.

47. A process according to Claim 46, wherein the crosslinker comprises triallylisocyanurate.

48. A process according to Claim 39, wherein the solid blend of uncured fluorocarbon elastomer and thermoplastic further comprises a crosslinker containing two or more sites of olefinic unsaturation.

49. A process according to Claim 48, wherein the crosslinker comprises triallylisocyanurate.